

LOUISIANA COASTAL WETLANDS RESTORATION PLAN



BRETON SOUND BASIN APPENDIX B

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APPENDIX B

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Breton Sound Basin

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INTRODUCTION

STUDY AREA

The Breton Sound Basin encompasses approximately 676,400 acres of which 184,100 acres are wetlands. It is bounded on the west by the Mississippi River, on the north by Bayou La Loutre, on the east by the south bank of the Mississippi River Gulf Outlet (MRGO), and on the south by Baptiste Collette Bayou and Breton Island (Figure 1). The basin includes portions of Plaquemine and St. Bernard Parishes. It consists of approximately 51,300 acres of public land equaling 28 percent of the total lands within the basin.

The Breton Sound Basin is divisible into four subbasins: the River aux Chenes Subbasin, which is defined by the Mississippi River on the west and north and the River aux Chenes on the east; the Caernarvon Subbasin, which is defined by the River aux Chene on the west, the Mississippi River and Bayou La Loutre on the north, and Bayou Terre aux Boeufs on the east; the St. Bernard Subbasin, which is defined by Bayou Terre aux Boeufs on the west, Bayou La Loutre on the north and the MRGO on the east; and the Bohemia Subbasin which is defined by the fringe marshes from where the River aux Chenes ends, in the vicinity of Bohemia, to Baptiste Collette Bayou.

EXISTING PROJECTS

U.S. ARMY CORPS OF ENGINEERS

An important feature critical to the restoration of the Breton Sound Basin is the Caernarvon Freshwater Diversion (CFD). It is located south of New Orleans, Louisiana on the left descending bank of the Mississippi River at approximate mile 81.5. This project is authorized by Public Law 89-298, 89th Congress, 1st Session approved October 27, 1965, and subsequent acts. The primary purpose of this project is to divert freshwater from the Mississippi River into adjacent estuarine areas to counter saltwater intrusion and enhance fish and wildlife productivity in the basin.

Construction of the Caernarvon Freshwater Diversion project was completed in February 1991 at a total cost of approximately \$26 million. The design capacity of the structure is 8000 cfs. It is projected that the total marsh saved in the Breton Sound Basin would be in excess of 16,000 acres, or about 320 acres per year for 50 years. In addition, improvement in the habitat quality of the marshes is expected to occur. Reductions in rates of habitat loss and habitat quality degradation will enhance wildlife productivity. Reductions in rates of marsh loss and saltwater intrusion along with increased nutrients, and maintenance of favorable salinities will enhance fishery production.

To fully utilize the resources provided by this project, an outfall management plan should be implemented (see BS-3A).

U.S. FISH AND WILDLIFE SERVICE

The Breton National Wildlife Refuge encompasses 18,273 acres which is approximately 3 percent of the Breton Sound Basin.

STATE OF LOUISIANA

The Bohemia Wildlife Management Area encompasses 33,000 acres which is approximately 5 percent of the Breton Sound Basin.

Two adjacent freshwater diversion structures presently operate at Bayou Lamoque on the left descending bank of the Mississippi River across from Empire, Louisiana. They were constructed in 1956 and 1974 by the Louisiana Department of Transportation and Development, in partnership with the Louisiana Department of Wildlife and Fisheries, and the Plaquemines Parish government. Diverting freshwater from these structures assists in maintaining favorable productive fish and wildlife conditions in California Bay. The structures are left open most of the year, and can divert up to 12,000 cfs.

PLAQUEMINES PARISH

The Bohemia freshwater diversion structure is located on the left descending bank of the Mississippi River approximately 3.5 miles south of Pointe a la Hache, Louisiana. Constructed by the Plaquemines Parish government in 1965, the project purpose is to reduce saltwater intrusion. The structure is presently inoperable due to sedimentation and lack of maintenance.

The White's Ditch freshwater diversion, located on the left descending bank of the Mississippi River between the communities of Belair and Carlisle, is the oldest siphon in Louisiana. It was constructed in 1965 and was fully funded by the Plaquemines Parish government. The siphons discharge freshwater through the Belair Canal into River aux Chenes for salinity control to benefit oyster production. the design capacity of the structure is 250 cfs.

PROBLEM IDENTIFICATION

EXISTING CONDITIONS

GEOMORPHOLOGY AND HYDROLOGY

The Breton Sound Basin is the remnants of the Mississippi River delta lobe, the abandoned St. Bernard Delta. The principal hydrologic features of the Breton Sound Basin include the Mississippi River and its natural levee ridges, the flood protection levee, the MRGO south disposal bank, Bayou Terre aux Boeufs and River aux Chenes (abandoned delta distributaries), and the freshwater diversions at Caernarvon, White's Ditch, Bohemia, and Bayou Lamoque. The barrier islands are so far offshore they provide only minimal protection to the estuary. Elevations in the basin range from approximately +10 feet National Geodetic Vertical Datum (NGVD) along the natural levee ridges of the Mississippi River to 0 feet NGVD or below in the swamp and marsh areas.

Historically, the basin was characterized by the normal gradation of freshwater habitats in the upper end to saline marsh at the seaward end. The marsh between the distributary levees was essentially unbroken, with most water movement occurring through overland flow. Under natural conditions, river water would enter the basin primarily by overbank flooding, across the natural levee ridges of the Mississippi River, River aux Chenes, Bayou Terre aux Boeufs and Bayou La Loutre. These processes aided in the sediment nourishment of the marshes and the reduction of saltwater intrusion. The basin experienced only the gradual deterioration (subsidence, saltwater intrusion, sediment deprivation) which is the natural fate of an abandoned delta lobe of the Mississippi River. The rate of wetlands loss was low to moderate.

The Caernarvon Freshwater Diversion structure, completed in 1991, diverts Mississippi River water into the upper part of the basin. The structure is authorized primarily for coastal fisheries and wildlife enhancement, but it also benefits the vegetative wetlands of the basin. The structure is lessening the effects of saltwater intrusion, contributing to the preservation of existing wetlands.

VEGETATION

The basin contains a series of nearly parallel abandoned river distributary ridges separated by expanses of brackish and saline marsh, interspersed with numerous water bodies. Some forested wetlands and a few developed areas occur on the higher land of the distributary ridges. A unique characteristic of this basin is the scarcity of fresh marsh at its upper extreme. Less than 2 percent of the marshes in the basin are fresh and intermediate which is due to the lack of freshwater input and the increase in saltwater intrusion. Plate 1, at the end of this basin plan, and Table 1, depict the 1988 distribution of habitat types within the subbasins as compiled by the National Wetlands Research Center.

Table 1. Habitat Distribution in the Breton Sound Basin

Habitat Types	River aux Chenes (Acres)	Caernarvon (Acres)	St. Bernard (Acres)	Bohemia (Acres)	Total (Acres)
Fresh marsh	512	633	759	2,826	4,730
Interm. marsh	0	865	0	3,109	3,974
Brackish marsh	27,835	64,210	21,482	3,814	117,341
Saline marsh	<u>2,293</u>	<u>12,436</u>	<u>19,538</u>	<u>23,699</u>	<u>57,966</u>
Total Marsh	30,640	78,144	41,779	33,448	184,011
Cypress swamp	85	0	0	0	85
Aquatic veg.*	411	290	1	3	705
Other land	10,303	12,314	2,278	7021	31,921
Water	<u>20,370</u>	<u>89,504</u>	<u>54,365</u>	<u>295,391</u>	<u>459,630</u>
Total Marsh	61,809	180,252	98,423	335,863	676,352

* Includes both floating and submerged beds.

FISH AND WILDLIFE RESOURCES

Economically important terrestrial animals in the area include nutria, muskrat, raccoon, mink, and otter which are harvested for their furs. The basin has the state's highest muskrat, nutria, and mink production per acre and the second highest raccoon production per acre. White tailed deer, rabbits, small mammals, waterfowl, and a variety of birds, reptiles, and amphibians also occur in the area. The basin provides roosting, loafing, and foraging habitat for numerous migratory and non-migratory bird species. The American alligator is harvested in the area for its meat and hide, especially in the swamps and fresh/intermediate marshes. Approximately 25,000 alligators were harvested from Breton Sound basin in 1990. The marshes and shallow bays in the area function as nursery grounds for valuable stocks of shrimp, oysters, crabs, and a variety of finfishes. These resources provide excellent opportunities for sport and commercial fishing.

The endangered Kemp's ridley sea turtle is found in the project study area. Threatened species which may be found in the basin include the Arctic peregrine falcon, the piping plover, the Atlantic loggerhead turtle and the green sea turtle.

PROBLEM IDENTIFICATION

ECONOMIC RESOURCES

Although the basin lies adjacent to the urbanized area of New Orleans, it retains its rural nature due to the limited amount of land suitable for urban purposes. The economic resources of the basin are among the nation's most significant, including major waterways (the Mississippi River, the Gulf Intracoastal Waterway, and the Mississippi River Gulf Outlet); large deposits of oil, natural gas, natural gas liquids, sulfur, and salt; and an abundance of commercially harvested finfish and shellfish. The area's economic base includes tourism; port activities; the production, processing, and transportation of oil, gas, and other minerals; and the sales and services normally associated with large regional markets.

COASTAL WETLAND PROBLEMS

The natural processes of subsidence, saltwater intrusion, and erosion of wetlands, and the human effects of river levee construction and the oil and gas industry, have caused major impacts to the Breton Sound Basin in recent decades. The two major wetland problems resulting from the natural process and human intervention in this basin are sediment deprivation and saltwater intrusion.

Historically, the basin was flushed with large quantities of freshwater and sediments annually during the spring. Marine waters would then rise and enter the basin during the late summer and early fall months and would be flushed out the following spring. In the early 1930's, flood protection levees were raised along the Mississippi River as far south as Bohemia in the Breton Sound Basin. This prevented the annual input of freshwater, nutrients, and sediment that nourished the wetlands and combatted saltwater intrusion.

Between 1940 and 1970, 12.9 square miles (8,256 acres) of canals were dredged across and between the abandoned distributary ridges that run from the river to the outer fringes of the marsh (Gagliano et al, 1970). This has allowed channelized outflow of fresh water and increased tidal flux.

The combination of natural processes and human intervention has allowed saltwater to enter close to the head of the basin. Much of the fresh and intermediate marsh that occurred in the upper basin earlier in this century has either converted to more saline habitats or has become open water as a result of sediment and nutrient deprivation brought about by the construction of flood protection levees and saltwater intrusion caused by the dredging of oil and gas access canals through and between the natural distributary ridges.

Subsidence combined with sediment and nutrient deprivation has contributed greatly to the marsh loss in the upper and middle basin and even more greatly in the Bohemia Subbasin. The subsidence rate ranges from 0.6 feet per century in the upper portion of the basin to 4 feet per century in the lower portion. The effect of subsidence is very apparent in the area south of Bohemia which was created by alluvial deposits of the Mississippi River less than 1,000 years ago. Large areas of wetlands flanking the Mississippi River in this area have, and are continuing to subside and convert to open water. Periodic over-bank flows from the Mississippi River occur in this area and some wetlands immediately adjacent to the river are being maintained by this input of sediments and freshwater.

A significant cause of wetland loss in the Breton Sound Basin is erosion of shorelines by wind wave action. Along the shoreline of the outer marshes and around the perimeter of the larger bays, erosion rates of 5 to 10 feet per year are common. These high rates occur in the fringe marshes because the Breton barrier islands are so far offshore that they offer little protection to the estuary behind them.

Land loss rate data from the U.S. Army Corps of Engineers show a slightly downward trend of loss from 1932 to 1990. Table 2 gives the acres loss and percent per year loss rates for the subbasins calculated for four different time intervals between 1932 and 1990. From 1932 to 1990, the basin lost over 45,000 acres of marsh, approximately 25 percent of the basin's wetlands. Most of the losses occurred in the Bohemia subbasin (Table 2).

Table 2. Historic Wetlands Losses in the Breton Sound Basin

Time Period	St. Bernard		Caernarvon		River aux Chenes		Bohemia		Total
	Loss (Acres)	Percent per Yr	Loss (Acres)	Percent per Yr	Loss (Acres)	Percent per Yr	Loss (Acres)	Percent per Yr	
'32-'58	2,584	0.17	3,388	0.12	1,257	0.10	3,231	0.27	10,460
'58-'74	4,417	0.50	8,747	0.50	2,189	0.30	3,540	0.52	18,893
'74-'83	2,370	0.51	3,983	0.44	1,100	0.28	1,891	0.54	9,344
'83-'90	754	0.22	1,381	0.20	574	0.19	3,779	1.45	6,488
Total	10,125	17.4	17,499	15.5	5,120	11.0	12,447	11.0	45,185

USACE GIS Data Base

FUTURE WITHOUT-PROJECT CONDITIONS

WETLAND CHANGES

Table 3 shows the losses estimated over the next 20 and 50 years based on 1974-1990 loss rates from Table 2.

Table 3. Projected Marsh Loss in the Breton Sound Basin

Subbasin	Projected Loss in 20 years		Projected Loss in 50 years	
	(Acres)	(Percent)	(Acres)	(Percent)
River aux Chenes	500	2	1,230	4
Caernarvon	5,100	7	12,760	16
St. Bernard	2,300	6	5,760	14
Bohemia	5,480	16	13,720	41
Total	13,380	*7.3	33,470	*18.2

*The effects of the Caernarvon Freshwater Diversion Structure are reflected in the projected losses for the Breton Sound Basin shown above in Table 3.

PROBLEM IDENTIFICATION

Nearly 21 percent of the wetland area in the Breton Sound basin has been lost since 1932. Over the next fifty years, approximately 41 percent of the marshland present in the Bohemia subbasin in 1988 could be lost even though freshwater and sediments are introduced in some portions of the subbasin via existing freshwater diversions and overbank flow. Projected losses in the Caernarvon, St. Bernard, and River aux Chenes subbasins are expected to continue at rates of 4, 16, and 14 percent respectively.

Marshes in the upper part of the basin should benefit substantially from the recently constructed Caernarvon Freshwater Diversion structure which is expected to preserve 320 acres per year for 50 years, or 16,000 acres. Localized wetland building will occur in the immediate outfall of the structure at Big Mar. An outfall management plan for the structure is funded on the CWPPRA's 2nd Priority Project List. The project will make modifications to the hydrology of the project area to direct diverted waters through the marsh and shallow open water areas to improve freshwater and sediment distribution. Marsh loss will continue in the upper and middle parts of the basin where freshwater, sediments, and nutrients from the Caernarvon structure are insufficient to completely offset impoundment and sediment deprivation. The marshes in the lower basin will continue to deteriorate from wind-generated wave action and tidal scour following the general abandoned delta break-up process. Marshes south of Bohemia will continue to subside, erode, and convert to open water except for those areas nearest to the river, which will be maintained by periodic nourishment from overbank flow.

FISH AND WILDLIFE RESOURCES

The Caernarvon Diversion structure provides for more favorable salinity regimes in the basin for a wide range of fish and wildlife resources. The structure is currently being operated to maximize fishery production, especially oysters. Populations of migratory waterfowl and other avian and terrestrial animals will decline from lack of suitable habitat.

ECONOMIC RESOURCES

In the near term, without-project conditions are expected to follow recent trends. The establishment of a more diversified economy is important for future economic growth. The economies of communities in the basin are largely based upon oil and gas and renewable biological resources. Fishery harvests have increased, largely due to increased numbers of harvesters, each of which is harvesting less per man-hour than was harvested ten years ago.

PLAN FORMULATION

PLANNING OBJECTIVES FOR THE BASIN

The planning objectives are based on identified problems, needs, and opportunities, and concerns of public, state, and local interests. The primary objective is to optimize existing freshwater and sediment inputs in the basin. The secondary objective is to restore fluvial inputs of sediment and freshwater. The tertiary objective is to restore the natural compartmentalized hydrology within the basin. The quaternary objective is to preserve saline marshes. Accomplishing these objectives will greatly enhance the longevity of existing marshes, improve water quality, reduce saltwater intrusion, and offset the effects of subsidence.

STRATEGIES CONSIDERED

Actions required to achieve the planning objectives fall into two categories, short term and long term:

SHORT TERM

- 1) manage existing freshwater diversion outfalls to increase sediment deposition and increase overbank flow to nourish wetlands and reduce saltwater inflows;

LONG TERM

- 1) build new large scale sediment diversions to the basin from the Mississippi River to decrease salinity and create and preserve wetlands;

- 2) rebuild natural levee ridges to restore the natural compartmentalized hydrology to increase freshwater retention time in the marshes and to combat saltwater intrusion;

- 3) create artificial barriers to preserve brackish and saline marsh.

Short Term Strategy 1). The short term strategy is to manage the outfall from the Caernarvon Freshwater Diversion, which benefits most of the basin. This strategy is critical because it preserves the existing wetlands until the long term phase of the plan can be implemented. The supportive short term strategy consists of managing the outfall from White's Ditch, Bohemia, and Bayou Lamoque Diversions which will benefit smaller, isolated areas within the basin. Management of the diversions will route the freshwater and sediment through the marshes and provide greater deposition of sediments to offset subsidence and a greater utilization of nutrients by vegetation. The management plans include the modification of existing channels to distribute freshwater, degrading dredged material disposal banks, bank gapping and the closure of abandoned oil and gas canals. Another feature of the supportive short term strategy is the degrading of a bank stabilization dike constructed along the left descending bank of the Mississippi at Olga to permit overbank flow to the wetlands between the Mississippi River and Grand Bay.

PLAN FORMULATION

Further, the rearrangement of rock at the head of the Jurjevich Canal will allow mostly freshwater to enter the basin through the canal, Grand Bay and the adjacent wetlands. These features will nourish the wetlands and reduce saltwater inflows in the lower basin.

Long Term Strategy 1). This strategy is critical in the long term to the restoration of fluvial inputs to the basin to create wetlands and entails the construction of a large scale sediment diversion in the vicinity of Bohemia. The diversion from the Mississippi River will be uncontrolled and will consist of an earthen crested weir and an outflow channel. The area targeted for marsh creation is located between the Mississippi River and the fringe marshes of the Caernarvon Subbasin. Because several diversions have been recommended in the Louisiana Coastal Restoration Plan which basins will receive these resources and in what amounts will be determined by a feasibility study to be funded by the CWPRA.

Long Term Strategy 2). The strategy consists of the repair of the natural levee ridges of River aux Chenes, Bayou Terre aux Boeufs, Cane River, and Bayou La Loutre along with the plugging of several canals dredged through and between these ridges with rock structures to restore previous flow conditions. Repair of these ridges and the plugging of these canals will prevent saltwater intrusion into the inner marsh areas, reduce tidal amplitude in the system, increase freshwater and nutrient retention, and increase sediment deposition from the diversions.

Long Term Strategy 3). This strategy consists of the construction of a noncontinuous earthen barrier along the middle to lower basin to reduce saltwater intrusion and to create a large area for outfall management of existing freshwater and future sediment diversions. In addition, this strategy will provide greater management capabilities for outfall of freshwater and nutrients in the basin and will provide greater sediment deposition, offsetting subsidence. Also to be included if less costly construction techniques are developed, is the construction of artificial barrier islands near the existing shoreline to preserve the fringe marshes of the St. Bernard Subbasin.

RATIONALE FOR SELECTED STRATEGIES

Each of the strategies listed above implements an aspect of the planning objectives for this basin. The short term strategy and the three long term strategies are complementary and together provide a balanced approach to create, restore, protect and enhance wetlands.

The critical action that must be taken is the implementation of short term strategy 1 to manage the outfall of the Caernarvon Freshwater Diversion which will produce immediate improvements within a majority of the basin. This critical strategy will preserve the existing wetlands until the long term strategies can be implemented. Strategy 2, to be implemented in the long term, is critical because it is the most feasible way of creating wetlands. Strategies 3 and 4 would be implemented in the long term and support the other strategies.

IMPLEMENTATION OF SELECTED PLAN

COMPONENT PROJECTS

Optimization of existing basin diversions through outfall management and optimization of sediment resources from the Mississippi River below Bohemia are critical features required in maintaining and restoring the hydrology of this basin. The projects determined to be critical for implementation of the selected plan are BS-3A Caernarvon Outfall Management (South of Big Mar) and PBS-7 Bohemia Sediment Diversion (large scale). These two projects, along with the six projects classified as supportive short term, form the foundation of the "selected plan" (see Figure 3). Projects which accomplish outfall management, critical or supportive, are to be implemented in the short term. Projects which accomplish optimization of available sediment resources through diversions deemed critical long term, are to be implemented upon completion of feasibility studies to determine the optimal site location.

Projects considered for the Breton Sound Basin are listed below and in Table 4. The table indicates project type, classification (e.g. critical, supporting), project status, acres created, restored, or protected; net benefitted acres, cost per benefitted acre, the estimated project cost, and comments. Project locations are shown on Figure 4.

Short Term Critical Project.

*BS-3A Caernarvon Diversion Outfall Management (South of Big Mar)

Long Term Critical Project.

PBS-7 Bohemia Sediment Diversion (large scale)

Short Term Supporting Projects.

BS-1A/B Restoration of Bohemia Diversion and Outfall Management

*BS-4A White's Ditch Outfall Management

BS-5 Bayou Lamoque Diversion Outfall Management

BS-6A/B Pump Outfall Management (North of Lake Lery)

PBS-6 Grand Bay Crevasse

PBS-14 Foreshore Dike Restoration at Olga

Long Term Supporting.

PBS-4 Diversion of the Mississippi River into Breton Sound

PBS-5 Fiddler Point Barrier Island

PBS-8 Interior Barrier

PBS-9 Interior Ridge Restoration and Enhancement

Demonstration Project.

PBS-13 Oyster Reef Demonstration

* Indicates a Priority List Project.

IMPLEMENTATION OF SELECTED PLAN

DEVELOPMENT OF BENEFITS AND COSTS.

The benefits for most of the following projects were estimated according to a modified rapid-assessment Wetland Value Assessment (WVA) protocol based, in part on project-specific information which varied in quality and quantity among projects. The estimates are therefore rough approximations considered preliminary to a more in-depth assessment, and should be interpreted as such. However, this was the only method to rapidly compare benefits of various projects. Information for shoreline erosion and marsh creation projects may be more accurate since it is quite site specific. Benefits for hydrologic restoration and marsh management projects are more generic and thus less accurate.

Projects which have been included on the first three Priority Project Lists have had complete indepth WVA analysis.

Cost estimates for all projects were done according to a generic CWPPRA cost formula which includes the construction cost plus 12.5 percent for engineering and design; 11.5 percent for supervision and administration; and 25 percent for contingencies; plus monitoring and operation and maintenance for 20 years.

Projects on the first three Priority Project Lists received more rigorous and detailed cost estimates.

COSTS AND BENEFITS OF SELECTED PLAN

Over the next 20 years, 13,380 acres of marsh will be lost in the Breton Sound Basin. The proposed projects (Table 4), critical (short and long term) and short term supportive, will create, restore, or protect approximately 5,206 acres, 39 percent of the predicted loss at a cost of \$11,367,000. In addition, these projects will allow submerged aquatic vegetation to cover approximately 979 acres and enhance an additional 326 acres of wetlands.

The selected plan provides a balanced approach to improving conditions in the basin. Hydrologic restoration is the primary feature and accounts for the majority of the acres created, restored, or protected.

If less costly techniques are developed, the Fiddler Point Barrier Island project could be implemented. Construction of this project will create, restore, or protect an additional 1911 acres, preventing 10 percent of the projected loss. In addition, the project will allow submerged aquatic vegetation to cover approximately 893 acres and enhance 550 acres of wetlands. The cost of constructing this barrier island system using present technology is estimated to be \$55,115,500. The cost per acre is \$117,768 and is nearly 30 times the average cost per acre of the other proposed projects. Thus, the recommendation is to proceed with all the short term projects and postpone barrier island construction until techniques are developed to decrease their cost.

Fully implementing the selected plan will greatly improve conditions within the Breton Sound Basin, and the area will flourish as a vital wetland.

Table 4. Summary of the Breton Sound Basin Projects

Project No.	Project Name	Project Type	Priority List Project	Acres Created, Restored, or Protected	Net Benefitted Acres	Estimated Cost (\$)	Cost Per Benefitted Acre (\$/Ac)	Comments
<u>Critical Project, Short-Term</u>								
BS-3a	Caernarvon Diversion Outfall Mgmt S. of Big Mar	OM	PPL2	812	1,758	1,885,000	1,100	Interacts w/ BS-4a
<u>Critical Project, Long-Term</u>								
PBS-7	Bohemia Sediment Diversion (large scale diversion)	SD	*	3,350	4,760	3,118,000	700	Compatible with PBS-4
<u>Supporting Projects, Short-Term</u>								
BS-1a/b	Restoration of Bohemia Diversion and O/F Mgmt	OM		124	658	1,642,000	2,500	Interacts w/ PBS-7 and BS-1a/b
BS-4a	White's Ditch Outfall Management	OM	PPL3	37	305	601,000	2,000	Interacts w/ BS-3a
BS-5	Bayou Lamoque Diversion Outfall Management	OM		350	555	317,000	600	Interacts w/ PBS-7 and BS-1a/b, Can PPL 3
BS-6a/b	Pump Outfall Management N. of Lake Lery	OM		169	746	2,241,000	3,000	Interacts w/ BS-3a, Candidate PPL 3
PBS-6	Grand Bay Crevasse	SD		364	800	1,563,000	2,000	Interacts w/ PBS-14, Candidate PPL 2, 3
PBS-14	Foreshore Dike Restoration at Olga	HR						Interacts w/ PBS-6
Subtotal: Supporting Projects, Short-Term				1,040	3,060	6,364,000		
<u>Supporting Projects, Long-Term</u>								
PBS-4	Diversion of the Mississippi River into Breton Sound	SD						Compatible with PBS-7
PBS-5	Fiddler Point Barrier Island	BI						Not to be built unless cost are reduced
PBS-8	Interior Barrier	HR		*	1,875	12,480	2,600	To be tied into outfall mgmt plans
PBS-9	Interior Ridge Restoration and Enhancement	HR						To be built if PBS-7 is not
<u>Demonstration Project</u>								
PBS-13	Oyster Reef Demonstration	SP						Candidate PPL 2
Total Breton Sound Basin **				1,850	4,820	8,249,000		
Total Breton Sound Basin Including Long-Term Critical Projects ***				5,200	9,600	11,367,000		Includes only Short-Term Projects

Table 4. Summary of the Breton Sound Basin Projects

Project No.	Project Name	Project Type	Priority List Project	Acres Created, Restored, or Protected	Net Benefited Acres	Estimated Cost (\$)	Cost Per Benefited Acre (\$/Ac)	Comments
<u>Projects Not in Restoration Plan</u>								
PBS-1	Oak River Re-establishment	FD						Will cause over freshening of basin
PBS-2	Barrier from Point A La Hache to the MRGO	HR						Not compatible with PBS-7
PBS-3	Restoration of marsh N. of Lake Lery (see BS-6A/B)							To be accomplished by BS-6a/b
PBS-10	Caernarvon Sediment Diversion	SD						Engineeringly infeasible
PBS-11	Caernarvon Diversion Operation Modification	SD						Beyond the scope of PL-101-646
PBS-12	Divert Caer O/F into marshes N. of Lake Lery							Engineeringly infeasible
PBS-15	Scarsdale Spillway	SD						Socioeconomic impacts to great

BI Barrier Island Restoration

FD Freshwater Diversion

HR Hydrologic Restoration

SD Sediment Diversion

SP Shore or Bank Protection

OM Outfall Management

* Benefits not verified by the WVA work group

** Cost and benefits include only Critical Short-Term and Supporting Short-Term project

*** Cost and benefits include Critical Short and Long-Term and Supporting Short-Term projects

KEY ISSUES IN PLANNING

Project implementation will provide a steadily increasing stream of benefits to wetlands, fisheries, and wildlife resources, although the distribution of these resources will change. Project designs must include features which allow for the ingress and egress of aquatic organisms.

Implementation of freshwater and sediment diversion projects could cause an increase in the shoaling rate in the main channel of the Mississippi River. The increase in shoaling would result in additional maintenance dredging requirements, increasing the cost of the authorized navigation project. In addition, there would be the potential for increased sedimentation in oil and gas canals. Projects should be consistent with and support existing socioeconomic activities.

Project implementation could cause localized minor impacts to existing wetlands but would enhance overall wetland quality and quantity.

Project implementation would affect water quality. Potential water quality-related impacts include: minor thermal effects on juvenile aquatic life due to temperature changes; high flow rates along with raised water levels producing localized deposition and generally greater overall sedimentation; increased metals and nutrient influxes; introduction of manmade organic compounds; and increased dissolved oxygen supplies and flushing of stagnant receiving waters. Water quality effects will be addressed in project monitoring programs.

The cost of the selected plan is estimated to be \$43,367,000. Funding other than that obtained through the CWPPRA will be required in order to implement all the projects selected, especially those classified as long term.

PROJECT DESCRIPTION

CRITICAL SHORT TERM PROJECT

Critical short term projects are those projects which directly implement the basin's primary objective and the short term strategy. Sufficient data must be available for immediate implementation.

BS-3A CAERNARVON DIVERSION OUTFALL MANAGEMENT (SOUTH OF BIG MAR)

Location.

The project area is located south of the communities of Braithwaite and Caernarvon in northern Plaquemines Parish. The roughly 16,000 acre project area is bounded on the north by Big Mar and the Forty Arpent Canal, to the west and southwest by an unnamed pipeline ditch, and the east by Lake Lery, Bayou Mandeville, and the Caernarvon Canal.

Problems and Opportunities.

This project is essentially a redesign of the existing channelized outfall of the Caernarvon Freshwater Diversion. Currently, the freshwater and sediment exits the upper portion of the basin, the Caernarvon Subbasin, through rapid transport via channels, lakes, and canals. Construction of this project will route the freshwater and sediment through the marshes within the project area and provide greater deposition of sediments to offset subsidence, greater utilization of nutrients by vegetation, and a more gradual release of freshwater to the benefit of wildlife, fish, and shellfish while still benefiting the oyster reefs.

Description of Features.

The proposed project consists of the removal of 100 feet of retention levee on the west bank of the outfall channel to divert a portion of freshwater discharge into the western project area for more uniform flow pattern; repair of 37,000 feet of spoil bank to isolate oil field canals to retain water in the project area; isolation of abandoned oil field canals and other man-made channels to reduce tidal fluctuations and saltwater intrusion; removal of existing plug and utilization of existing modified channel to distribute freshwater into the project area; degrade and/or gap 254,000 linear feet of spoil banks to marsh level and place spoil in adjacent canals or on land as appropriate; dredging of new 1200 foot long alternate field access channel to enable closure of other channels; and repair of 104,000 lineal feet of project perimeter spoil bank to be maintained for flow control purposes (see Figure 5).

Benefits and Costs.

The cost of the project is estimated to be \$1,885,000. Addition of freshwater, sediments and nutrients is expected to enhance roughly 1,758 acres of marsh. This estimate includes all of the project area and marshes to the southeast out to Breton Sound. The enhancement includes freshening of the project area with an expected change in vegetative species composition towards a less saline environment throughout the enhanced area and increasing plant productivity. Sediment input from the Mississippi River should further enhance the area by offsetting coastal subsidence. Approximately 812 acres will be protected from the effects of saltwater intrusion, and subsidence through the addition of freshwater, sediment and nutrient input. The filling in of Big Mar and some of the shallow open water ponds to the south and southwest of Big Mar will increase marsh area by 2,600 acres. Outfall management will increase marsh productivity for reptile, furbearer and waterfowl populations. Increased freshwater, plant productivity and nutrient outwelling from the diversion discharge will benefit fisheries and shellfish well seaward of the project area. This in return will provide indirect benefits to recreational and commercial, fishermen, trappers, and sportsmen. The local economy will benefit from moneys brought in from these activities.(20 year project life)

Effects and Issues.

This project is not expected to have any adverse impacts on coastal habitats. The creation of marsh through sediment deposition will fill in Big Mar which will no longer be available as aquatic habitat.

Status.

A feasibility study is being prepared at this time. The project proposal has been subject to public review as part of the Louisiana Coastal Wetlands Conservation and Restoration Plan. No permit application has been filed. This project is to be implemented under the CWPPRA 2nd Priority Project List.

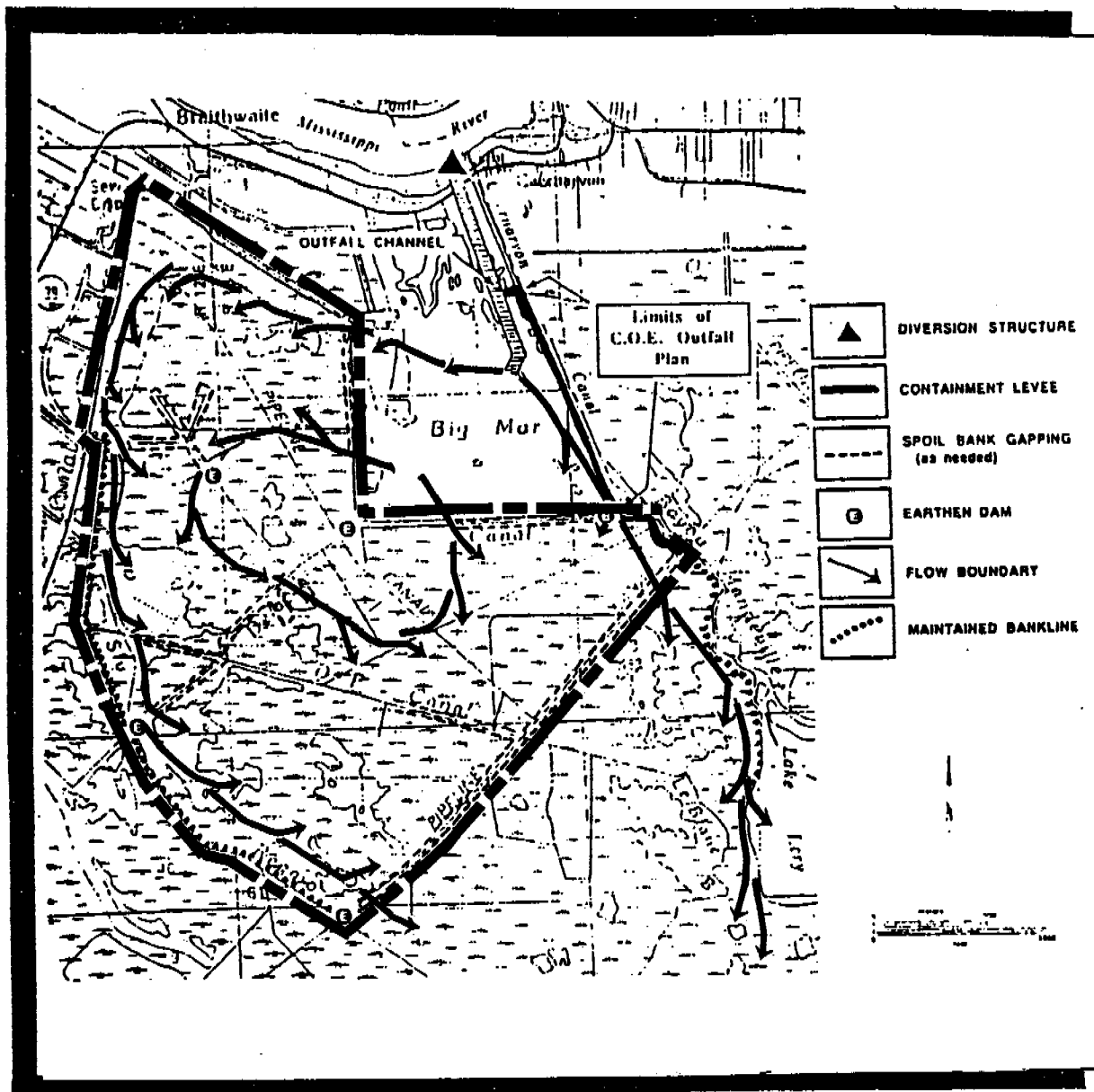


Figure 5 Caernarvon Diversion Outfall (BS-3A)

CRITICAL LONG TERM PROJECT

Critical long term projects are those projects which directly implement the basin's secondary objective and the primary long term strategy. Implementation of such projects will require lengthy planning, along with funding that is beyond the current capability of the CWWPRA.

PBS-7 BOHEMIA SEDIMENT DIVERSION (LARGE SCALE DIVERSION)

See project XMR13 for the Mississippi River Delta Basin.

Location.

The diversion channel would be tentatively located on the left descending bank of the Mississippi River at approximate river mile 40 above head of passes in the vicinity of the Bohemia Spillway.

Problems and Opportunities.

This project is a concept. It is also contingent upon the completion and performance of the West Bay project in the Barataria Basin which is to be constructed under the CWPPRA 1st Priority Project List.

Description of Features.

The design of this project would be similar to the West Bay Project, an uncontrolled sediment diversion, which utilizes an earthen crested weir and outflow channel. The design capacity could range anywhere from 50,000 cfs to 20,000 cfs depending upon the target area size and location. To ensure the continued performance of the diversion, the outflow channel would be periodically dredged (see Figure 3 - Selected Plan).

Benefits and Costs.

The project costs would be comparable to the West Bay Sediment Diversion project. For the 50,000 cfs project, and the 20,000 cfs, the cost in present day dollars for a project life of 20 years is estimated to be \$6,328,000 million and \$3,118,000 million, respectively. The acres to benefit from this project would be comparable to those of the West Bay Sediment Diversion project. The 50,000 cfs project is estimated to create 7,500 acres while the 20,000 cfs project is to create an estimated 3,350 acres for a project life of 20 years.

Effects and Issues.

The primary issue would be the impacts of this project on the primary project purpose of the Caernarvon Freshwater Diversion Structure. Secondary issues would be impacts to the main river channel such as increased maintenance dredging, and the relocation of existing activities such as oil and gas pipelines, oil and gas access canals, and aerial power and telephone lines. In addition, estuarine fisheries would be displaced farther gulfward in the basin. Real estate acquisition problems would be incurred.

Status.

A detailed feasibility study is required.

SUPPORTING SHORT TERM PROJECTS

Near-term supportive projects are those projects which have sufficient information and implementation potential to be considered as possible candidates for the CWPPRA Priority Project Lists and address more-localized wetland protection and restoration needs and opportunities. Below is a list of the proposed projects which fall into that category.

BS-1A/B RESTORATION OF BOHEMIA DIVERSION AND OUTFALL MANAGEMENT

Location.

The existing structure is located on the east bank of the Mississippi River approximately 3.5 miles south of Point A La Hache.

Problems and Opportunities.

Marsh loss occurred at a rate of 354 acres per year from 1974-1990, in this area, Bohemia Subbasin, due to subsidence, saltwater intrusion and sediment deprivation.

Description of Features.

The project consists of the rehabilitation of the existing structure comprised of four 60 inch gated culverts designed to deliver 1000 cfs at normal high river stages. The outfall management area is located east of the existing structure. The primary feature of the outfall management plan would include the closure of the borrow canal east of the outfall channel by the construction of an earthen dam (see Figure 6).

Benefits and Costs.

Placing the existing diversion structure back in operation could benefit 658 acres through the input of freshwater, sediments, and nutrients from the Mississippi River. The cost of the project is estimated to be \$1,642,000. (20 year project life)

Effects and Issues.

Depending on operation procedures, adverse impacts to nearby oyster leases could occur. The project may cause siltation in the Back Levee Canal (borrow canal) which is the deepest route from the Pointe a la Hache marina to Breton Sound and, if so, would adversely affect usage of the waterway by oil and gas well service vessels and commercial and recreational fishing vessels. Vessels using this waterway would be forced to use shallower, alternate routes or relocate their facilities.

Status.

A detailed design is completed for the restoration of the existing structure. A feasibility study is being prepared for the outfall management portion of the study by the Louisiana Department of Natural Resources.

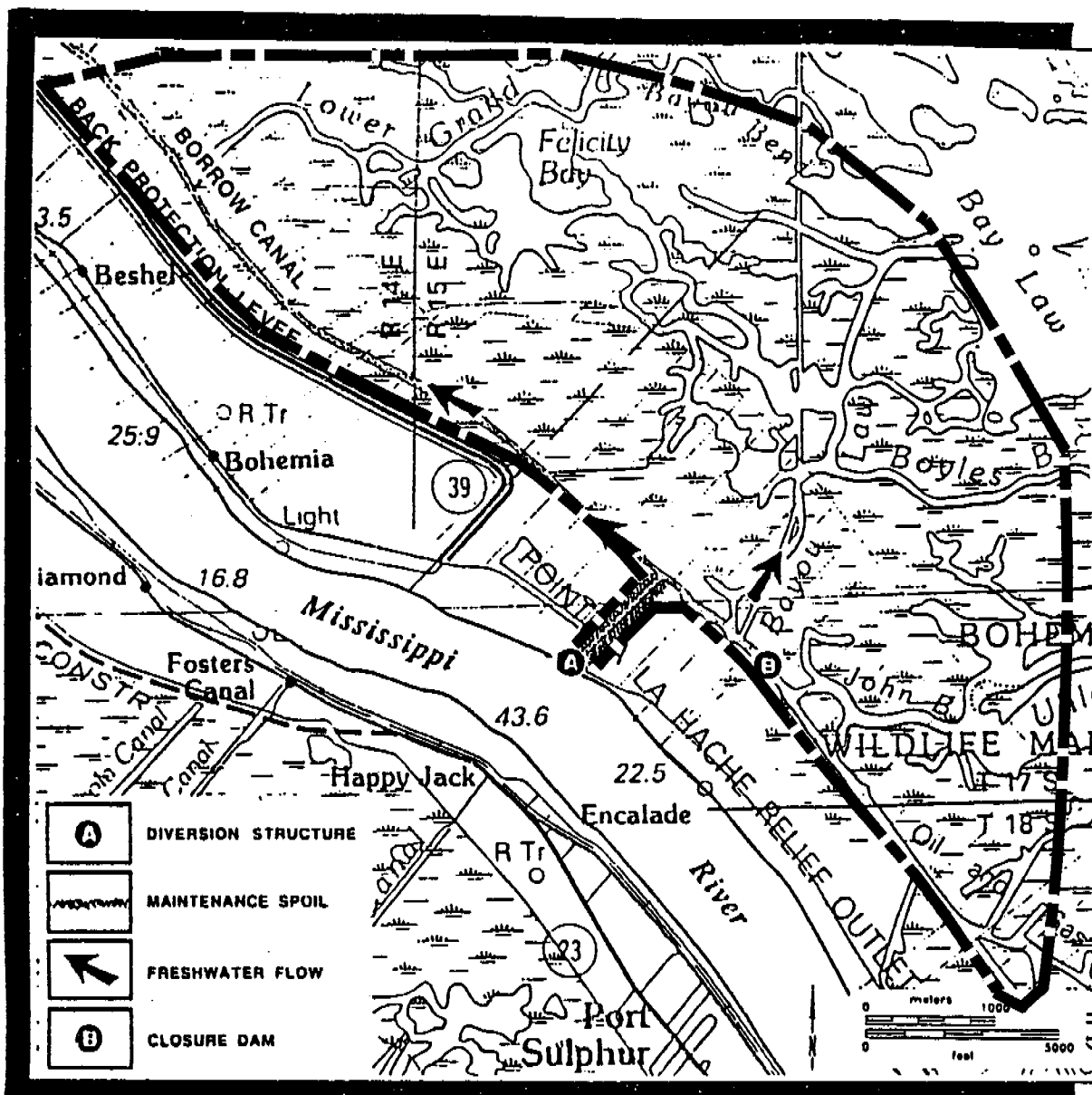


Figure 6 Restoration of Bohemia Diversion and Outfall Management

BS-4A WHITE'S DITCH OUTFALL MANAGEMENT

Location.

The existing project is located on the east bank of the Mississippi River between the communities of Belair and Carlisle, where there is no back levee. The siphon discharges through the Belair Canal into River aux Chenes. The outfall area encompasses a 6,500-acre area between the Mississippi River levee and River aux Chenes (see Figure 7).

Problems and Opportunities.

Marsh loss occurred in this area, River aux Chenes Subbasin, at a rate of 195 acres per year from 1974-1990 due to subsidence, saltwater intrusion and sediment deprivation.

Description of Features.

The existing structure consists of two 50 inch diameter, 800-foot long pipes. The outfall management plan focuses on limiting direct losses of freshwater to River aux Chenes through a series of closures and variable crested weirs.

Benefits and Costs.

The cost of the project is estimated to be \$601,000. Approximately 305 acres would be benefitted. *(20 year project life)*

Effects and Issues.

The construction of the project is contingent upon the outcome of the Caernarvon Diversion Outfall Management Project BS-3A which has been authorized for construction on the 2nd Priority Project List.

Status.

The project requires feasibility analysis, design, and permitting.

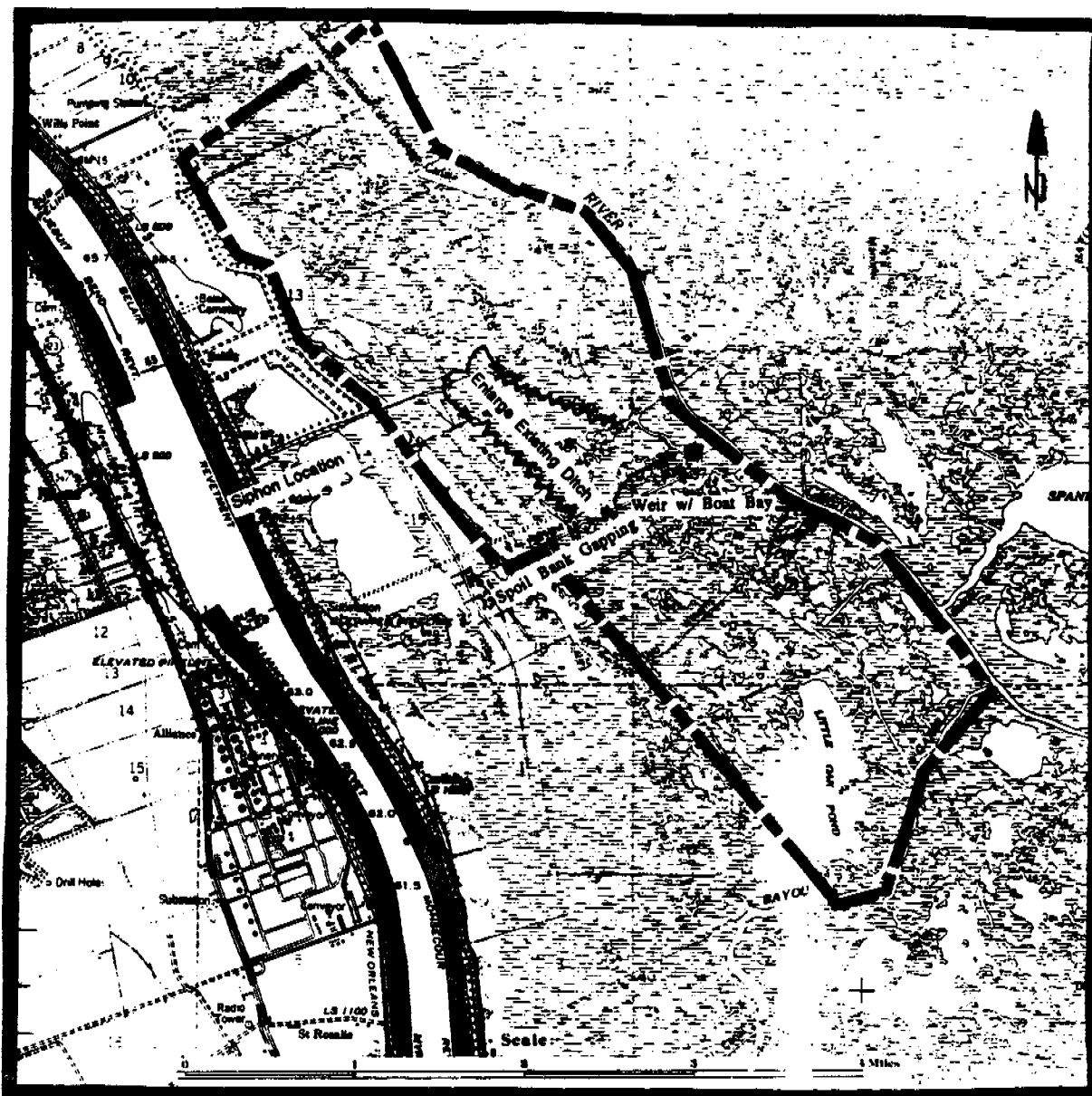


Figure 7 White's Ditch Outfall Management (BS-4A)

BS-5 BAYOU LAMOQUE DIVERSION OUTFALL MANAGEMENT-

Location.

The existing structure is located at Bayou Lamoque on the east bank of the Mississippi River across from the town of Nairn, Louisiana.

Problems and Opportunities.

Marsh loss occurred at a rate of 354 acres per year from 1974-1990, in this area, Bohemia Subbasin, due to subsidence, saltwater intrusion, and sediment deprivation.

Description of Features.

Two diversion structures are presently in operation. The structure delivers a total of 10,800 cfs during the normal annual peak flows of the Mississippi River. The older of the two structures was built in the 1950's and consists of four 10 X 10 foot gates. The newer structure consists of four 12 X 12 foot gates. Outflows from these structures converge into Bayou Lamoque, which carries the water to California Bay. Marshes are presently being bypassed by the diverted water. The outfall management plan involves the potential use of sediment trapping for marsh nourishment and marsh creation to offset subsidence (see Figure 8).

Benefits and Costs.

Approximately 555 acres of marsh will be benefitted. The cost of the project is estimated to be \$317,000.

Effects and Issues.

Routing of freshwater through the marshes adjacent to Bayou Lamoque would adversely impact a limited number of oyster leases.

Status.

This is a concept. A short feasibility study must be done to determine the feasibility of trapping sediment by diverting water through the adjacent marshes.



Figure 8 Bayou Lamoque Outfall Management (BS-5)

BS-6A/B PUMP OUTFALL MANAGEMENT (NORTH OF LAKE LERY)

Location.

The project is located in St. Bernard Parish and is bordered on the west by Big Mar, to the south by Lake Lery, to the east by the Oliver Canal, and to the north by the St. Bernard Ridge hurricane protection levee.

Problems and Opportunities.

Marsh is being lost in this area, St. Bernard Subbasin, at a rate of 354 acres per year from 1974-1990 as a result of saltwater intrusion and subsidence.

Description of Features.

The storm water runoff introduced into the Forty Arpent Canal would be pumped into the Lake Lery marsh by means of one small pump located along the hurricane protection levee and the pump outfall managed to benefit the brackish and saline marshes within the project area. Maximum pump discharge is projected to be approximately 888 cfs. Normal discharge is expected to be roughly 200 days/year. Project features include cleaning of the inflow and outflow channels, installation of 2 rock weirs with boat bays, and the construction of two earthen plugs. Upon completion of the project, the local sponsor will be responsible for all maintenance requirements (see Figure 9).

Benefits and Costs.

Approximately 746 acres of brackish marsh will be benefitted. The total construction cost of the pump is estimated to be \$7,000,000 of which \$6,000,000 is to be contributed by the Lake Borgne Levee District, the local sponsor. The estimated cost of the outfall management is \$1,241,000. Therefore, the total CWPPRA contribution is estimated to be \$2,241,000. (20 year project life)

Effects and Issues.

This project could prove to be an excellent example of the cost sharing process and encourage other local governments to participate.

The amount of rainfall runoff available from the Terre aux Boeuf ridge is very limited and may not be sufficient to produce the estimated project benefits. Withdrawal of water from the Pontchartrain Basin side of the ridge (as proposed) would negatively impact that basin unless the Violet Freshwater Distribution project (PO-9) is implemented. It would also decrease the anticipated benefits of the Violet Freshwater Distribution project to be gained in the Pontchartrain Basin.

Status.

A feasibility study is required.

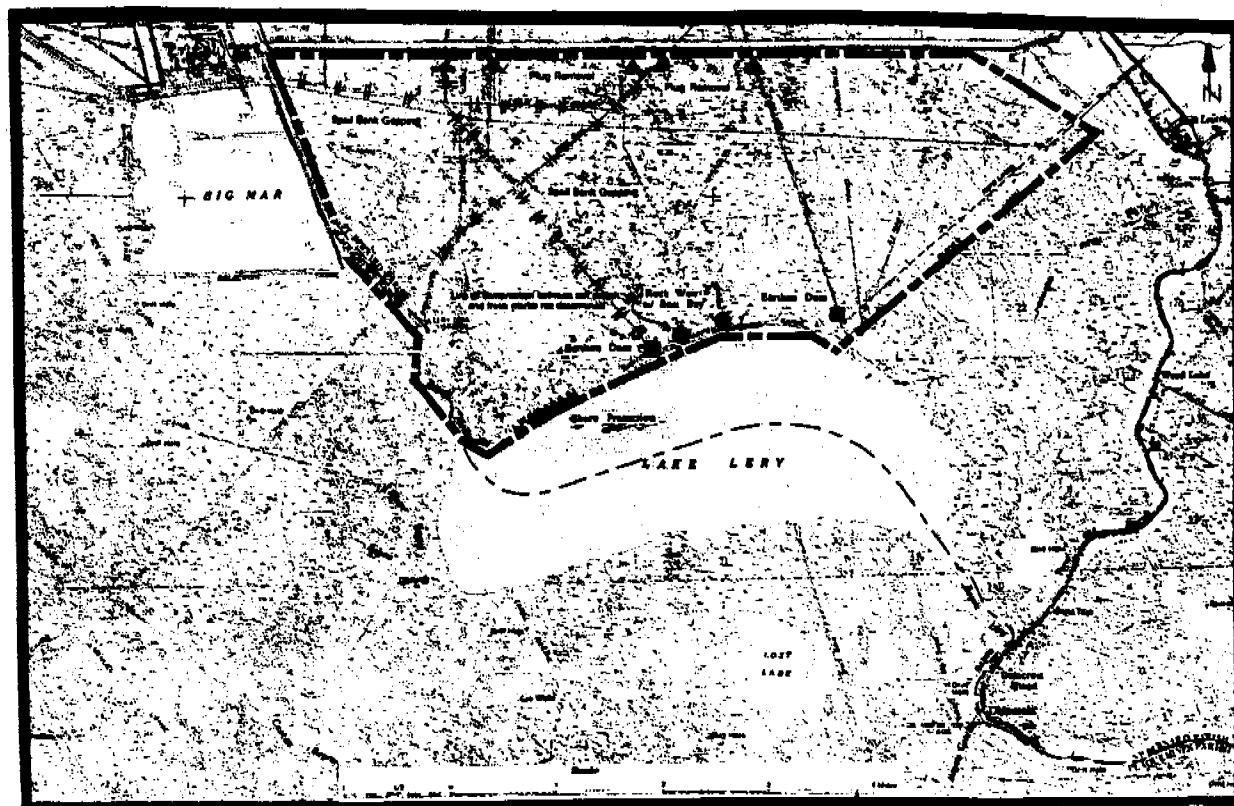


Figure 9 Pump Outfall Management North of Lake Lery (BS-6A/B)

PBS-6 GRAND BAY CREVASSE

Location.

The proposed project location would be at the Jurjevich Canal near Mississippi River mile 16.3, in Plaquemines Parish Louisiana. The coordinates of the project are latitude 29° 21' 00" and longitude 89° 24' 00".

Problems and Opportunities.

Marsh loss occurred at a rate of 354 acres per year from 1974-1990 in this area, Bohemia Subbasin, as a result of marine processes such as wave fetch, storm surge, saltwater intrusion and subsidence.

Description of Features.

The proposed project would consist of rearranging approximately 1,500 tons of rock at the head of the Jurjevich Canal, allowing a maximum 20,000 cfs of the Mississippi River water into the canal and Grand Bay and adjacent wetlands. The entrance of the canal will be lined with additional rock to prevent scouring of the canal. Sediment from the Mississippi River will eventually create a delta splay in Grand Bay (see Figure 10).

Benefits and Costs.

Approximately 800 acres of brackish marsh will be benefitted. The project would reduce the loss rate of the existing marsh from about 0.9 percent per year to 0.5 percent or about 44 acres over 20 years. The project life is 20 years, however benefits to the project area would continue past the project life. Fish and wildlife populations would benefit from the net increase of 364 acres of brackish marsh and the increased nutrients brought into the project area. The cost of the project is estimated to be \$1,563,000.

Effects and Issues.

Project implementation could negatively impact the significant oyster resources in the area by increasing pollution levels and turbidity. Also splay development will destroy oyster resources in the immediate area of the splay. There also would be the potential for siltation of oil and gas canals. Costs to compensate oyster fishermen have been included in the project plan. No conflicts with other programs are apparent.

Status.

This is a concept. A feasibility study must be done to determine the optimal size of the crevasse.

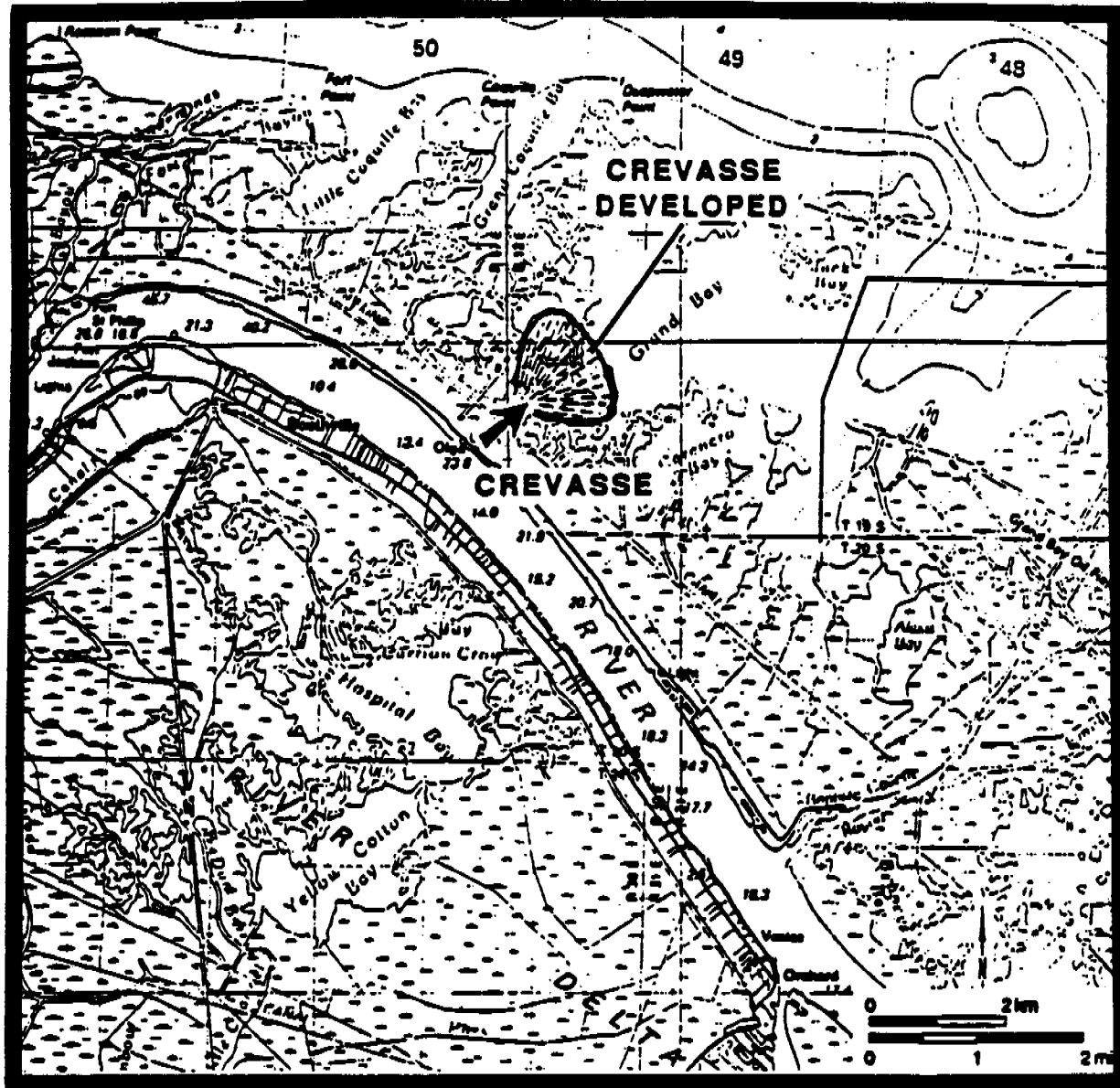


Figure 10 Grand Bay Crevasse (PBS-6)

PBS-13 OYSTER REEF DEMONSTRATION

Location.

The proposed demonstration area is on the northeast shoreline of Lake Jean Louis Robin, St. Bernard Parish at latitude 29° 45' 00" and longitude 89° 37' 30". The project would extend approximately 1,500 feet along the shoreline east of Spanish Bayou.

Problems and Opportunities.

Shoreline erosion at the proposed project area is approximately 5 feet per year (May and Britsch 1987). The proposed project is anticipated to convert a high-energy shoreline habitat to one of reduced energies and increased biological diversity. Aquatic primary productivity would be enhanced in the immediate area (perhaps 2 acres), with indirect benefits extending through the tropic web over time.

Description of Features.

The proposed project includes the construction of a relatively high-profile living oyster reef in shallow water on the northeast shore of Lake Jean Louis Robin. Reef block units, 5 feet wide by 3 feet high, would be constructed of heavy wire mesh and oyster shell on which a remote set of oyster spat had been induced. Reef blocks would be securely anchored on steel mesh and spaced on 7.5 foot centers over a 1,500 foot span.

Benefits and Costs.

Halting erosion in the project area for six years during the demonstration project will save one acre. If the demonstration project remained completely functional for an additional 18 years, direct benefits would total 4 acres. Benefits from the addition of many tons of oyster shell to area shorelines over an extended period of time would be considerable, but not quantifiable. The project cost is estimated to be \$348,000. (*6 year project life*)

Effects and Issues.

Land loss in the quadrangle has been 0.21 percent per year from 1956-1978 (DNR-GIS data). If demonstration project results are favorable and additional large-scale projects initiated within this quadrangle, a hypothetical long term reduction in loss rate of only 0.1 percent would result in the preservation of about 82 acres per year. The proposed technique will result in more rapid formation of reefs than through natural reef evolution (decades instead of hundreds of years). In addition, the proposed project would provide aquatic habitat diversity and enhanced fisheries production, with recreational and commercial fishing benefits. Conflicts with other projects and programs are not anticipated.

Status.

A feasibility study needs to be prepared.

PBS-14 FORESHORE DIKE RESTORATION AT OLGA

Location.

The existing project is located along the left descending bank of the Mississippi River between approximate river miles 21.2 and 17.8.

Problems and Opportunities.

Marsh loss is occurring in this area, Bohemia Subbasin, at a rate of 354 acres per year as a result of sediment deprivation, saltwater intrusion and subsidence. By restoring historical overbank flow in the project area, the land loss rate can be reduced and replenishment of the marsh can be obtained.

Description of Features.

A foreshore dike, 7 feet in height, was constructed in 1991. Restoring historical overbank flow can be achieved by reducing the height of the existing dike by 2 feet and thereby reintroducing freshwater, nutrients, and sediments into the project area.

Benefits and Costs.

Further investigation as to the potential acreage and habitat benefits is required. The cost of the project is estimated to be \$256,000.

Effects and Issues.

Possible oyster lease impacts.

Status.

Currently the U. S. Army Corps of Engineers and the U.S. Fish and Wildlife Service are preparing a monitoring program of the overland flow percentages and its effect on the foreshore dike. The monitoring program is to be implemented in the summer of 1993 and continue for one calendar year. Upon completion of the monitoring program a feasibility study will be conducted to determine the most effective height of the dike.

SUPPORTING LONG TERM PROJECTS

Long-term supportive projects are those projects in which not enough information is known to be proposed for evaluation and possible funding under CWPPRA. These projects require additional study or development of techniques to make them cost-effective.

PBS-5 FIDDLER POINT BARRIER ISLAND

Location.

The proposed project area extends from the southeastern edge of marsh in Plaquemines Parish, just west of the MRGO, west to the vicinity of Point Fortuna; centering at latitude 29° 39' 20" and longitude 89° 25' 50".

Problems and Opportunities.

Marsh is being lost in this area, St. Bernard Subbasin, at a rate of 354 acres per year from 1974-1990 as a result of saltwater intrusion and subsidence.

Description of Features.

It is recommended that an island about 800-feet wide, with 300 feet of fore dunes built to a height of +8 feet NGVD and 500 feet of back-barrier marsh built to a height of +3 feet NGVD be constructed. The dunes should be seeded (e.g., with sea oats and panicum), and the marsh platform planted with a variety of marsh plants appropriate to saline marsh. The island will be built using sediments dredged from a borrow pit parallel to the shoreline, just offshore of the proposed island. The borrow pit would be located about 0.5 to 1.0 mile offshore. A 30" cutter-head dredge would be used. Given an average depth for the area of about 6 feet, and assuming a side slope of 1:6, the volume of the proposed island would be about 9.3 million cubic yards. The estimated cut-to-fill ratio needed would be about 4:1. Each segment built would be tied in to an existing point of land.

Benefits and Costs.

Creation of a barrier island in front of the remnants of the Fortuna/St. Helena islands will serve to reduce fetch of open water forces, slow offshore mixing of freshwater inputs, and act as a sediment source to nearshore areas in addition to the creation of about 224 acres of wetlands. Approximately 1,911 acres will be benefitted. The estimated cost of the project is \$55,115,454. (*20 year project life*)

Effects and Issues.

No significant adverse environmental effects are anticipated. Oyster leases located near the project area may experience indirect impacts from increased sedimentation. The project is critical to the restoration plan; however, barrier island construction using present techniques is not cost-effective. Upon development of new techniques which would decrease the cost, this project should be implemented. Conflicts with other projects and programs are not anticipated.

PBS-4 DIVERSION OF THE MISSISSIPPI RIVER INTO BRETON SOUND

See Critical project PMR6 for the Mississippi River Delta Basin.

Location.

The diversion channel would be located on the left descending bank of the Mississippi River at approximate river mile 40 above head of passes in the vicinity of the Bohemia Spillway.

Problems and Opportunities.

The diversion of the flow and sediment from the Mississippi River could be accomplished by the construction of a new channel from the river to an adjacent estuary, where the sediment deposited would build emergent wetland more effectively than in the deep water at the river's mouth. The purpose of such a diversion would be to utilize the river's flow in order to distribute its sediment load to a shallow water estuary for creation of a new delta. With such a diversion, deep-draft navigation would need to be maintained in the Mississippi River's present channel where the industrial development requiring deep-draft access is located. It must be recognized that a major study effort will be required prior to execution of any construction. It must also be recognized that such a study will be a substantial undertaking and may require separate, or additional, funding and authority.

Description of Features.

The concept of re-routing the navigation channel through Breton Sound has been studied in the "Louisiana Coastal Area, Mississippi River Delta Study" at a reconnaissance level utilizing a 50 year project life.

The project consist of the construction of a pilot diversion channel approximately 15 miles in length, with a bottom width of 300 feet at an invert elevation of -10.0 feet NGVD. It is expected that 70 percent of the Mississippi River flow would pass through the diversion channel. Stabilization measures along the main river channel to secure both the river and the diversion channels at the point of diversion may be required.

Benefits and Costs.

The construction costs for this project, updated to current price levels, are estimated to be \$104.2 million. Construction costs for the diversion and pilot channels are estimated to be 10.9 million. The remaining \$93.3 million include the cost for construction of a jetty along the west side of the MRGO through Breton Sound, relocation of existing activities, and additional saltwater mitigation measures. Operation and maintenance costs associated with project implementation include an estimated \$11.7 million annually for increased dredging requirements, and estimated \$1.0 million annually for maintenance of saltwater mitigation features, and \$3.5 million annually for maintenance of the MRGO jetty. Under the CWPPRA monitoring criteria, a project of this size and type would be allocated a monitoring budget of approximately \$26,000 per year. Therefore, the total 50 year project cost is estimated to be \$915,500,000. The net gain in wetlands creation for a 50-year project life is estimated to be approximately 89,000 acres.

Effects and Issues.

Both beneficial and adverse effects are expected to occur. The creation of approximately 89,300 acres over 50 years of fresh-intermediate marsh in the Breton Sound basin is beneficial. However, adverse impacts to commercial fisheries in the Breton Sound would be extreme. Losses would extend to jobs, the boat manufacturing industry, the processing equipment industry, and property and tax values in this area. Communities along the lower river downstream of the diversion site would also experience impacts to their water supplies as would industries in this area. Re-routing the navigation channel through Breton Sound Basin would have a major impact to the Mississippi River Delta Basin where approximately 31,000 acres of marsh would be lost with construction of the proposed project. However, the materials would be reworked to form or nourish barrier islands and down drift marshes. The acquisition of property and easements for sediment diversion projects have resulted in both legal and real estate problems in the past. The creation of marsh in wetlands and open water areas have raised questions as to land ownership. Impacts to navigation would result from induced shoaling and the added cost of additional maintenance dredging.

Status.

A detailed feasibility study is required.

PBS-8 INTERIOR BARRIER

Location.

The earthen barrier would extend across the middle to lower basin in the River aux Chenes, Caernarvon, and the St. Bernard Subbasins.

Problems and Opportunities.

The River aux Chenes, Caernarvon, and the St. Bernard subbasins are experiencing marsh loss due to subsidence, saltwater intrusion, and erosion. This project will reduce saltwater intrusion, increase freshwater and nutrient retention, and increase sediment deposition from diversions.

Description of Features.

This project, as currently proposed, would consist of a noncontinuous earthen barrier to be accomplished by dredging and creating a spoilbank as a line of defense. The project would create a large area for outfall management of existing and future freshwater and sediment diversions in the middle and upper basin. The project entails placing a 24 mile barrier along the middle to lower basin. It would be placed across both land and water and contain 10 openings for marine organisms and boat access. The openings should be placed at extensions of natural channels and major man-made waterways. Waterways used by small vessels only should be lined with rock to reduce the influx of higher salinity waters. The barrier would be 4 feet above gulf level, have a 5 to 1 slope, and a 12 foot top width. The project may include the gapping of spoil banks between the natural ridges, depending on the opportunity to get freshwater and nutrients from on-going or planned outfall from diversions in the basin.

Benefits and Costs.

The project is estimated to be \$32,000,000. The cost estimates are based on the barrier reaching across the basin with half the barrier on land and half the barrier in open water. These costs include levee creation and rock armoring of openings. The benefits would be the protection of the interior marshes northwest of the barrier. Further investigation as to the potential acreage and habitat benefits for a 20 years project are required.

Effects and Issues.

The project will provide greater management capabilities for outfall of freshwater and nutrients in the basin and should increase the deposition of lighter sediments transported from diversion projects. The increase in sediment deposit will help to offset the current subsidence. The freshwater retention will push the higher isohalines toward lower reaches of the basin. Approximately 100 acres of wetlands would be covered by the barrier. This project would cause massive changes in the hydrology of this basin and would require a major feasibility study effort to determine quantities and impacts. Impacts to navigation would be incurred. Oyster leases may be adversely impacted. Bisecting of some lakes in the lower basin would occur.

SUPPORTING LONG TERM PROJECT(S)

Status.

A detailed feasibility study is required.

PBS-9 INTERIOR RIDGE RESTORATION AND ENHANCEMENT

Location.

River aux Chenes, Caernarvon, and St. Bernard Subbasins.

Problems and Opportunities. As a result of dredging oil and gas access canals, the natural ridges within the basin were breached allowing saltwater into the middle and upper basin. Restoration of these natural ridges will restore the natural compartmentalized hydrology and will reduce saltwater intrusion within the basin.

Description of Features.

The project consists of plugging man-made canals that bisect or connect the major ridges in the basin in order to morphologically recreate the natural ridges. The project may include gapping or degrading of spoil banks depending on the opportunity to get freshwater and nutrients from on-going or planned outfall diversions in the basin.

Benefits and Costs.

The cost of the project is estimated to be \$32,000,000. Benefits are being developed and may be difficult to quantify. Further investigation as to the potential acreage affected and habitat benefits are required.

Effects and Issues.

This project would prevent saltwater intrusion into some of the inner marsh areas, reduce tidal amplitude in the system, increase freshwater and nutrient retention, and increase sediment deposition from diversions. The major issue would be the cutting off of access to oil and gas wells and fishing and hunting areas.

Status.

A detailed feasibility study is required.

PROJECTS CONSIDERED BUT NOT IN THE RESTORATION PLAN

PBS-1 OAK RIVER FLOW RE-ESTABLISHMENT -

Location.

The proposed project location is on the east bank of the Mississippi River near Bertrandville, Louisiana.

Problems and Opportunities.

Marsh loss occurred at a rate of 105 acres per year from 1974-1990 in this area, River aux Chenes Subbasin, as a result of saltwater intrusion, subsidence, and sediment deprivation.

Physical Characteristics.

The proposed project would consist of the establishment of a 2,500 cfs fresh water diversion to divert Mississippi River water into Joe Brown Canal, thence into the Forty Arpent Canal and thus to enter the River aux Chenes. Project features would include construction of a containment levee around Joe Brown Canal, construction of earthen plugs, and creation of levee breaches along the River aux Chenes.

Benefits and Costs.

The cost of the project is estimated to be \$7,869,000. Further investigation as to the potential acreage and habitat benefits are required. Preliminary evaluations estimate the benefits to be approximately 1880 acres.

Effects and Issues.

This project could conflict with the Caernarvon Diversion Freshwater Structure's operating scheme of providing benefits to fisheries, wildlife, and wetlands and could cause overfreshening of the basin from a fisheries perspective.

The primary issue of supplying additional freshwater to the basin was determined undesirable as long as the Caernarvon Freshwater Diversion Structure is in operation. Secondary issues would be impacts to the main river channel such as increase maintenance dredging, and the relocation of existing activities such as oil and gas pipelines, and access canals. In addition, estuarine fisheries would be displaced farther gulfward in the basin.

Status.

The project was not selected for inclusion in the comprehensive restoration plan for the Breton Sound Basin.

PBS-2 BARRIER FROM POINTE A LA HACHE TO MRGO

The project was not selected for inclusion in the comprehensive restoration plan because construction of the Bohemia Sediment Diversion (large scale), PBS-7, would negate the need for a saltwater barrier in this area. Creation of marsh will act as a natural barrier against saltwater intrusion. In addition, extensive acreage of existing marsh may be covered by the barrier.

PBS-3 RESTORATION OF MARSHES (NORTH OF LAKE LERY)

The project purpose is to be accomplished by project BS-6A/B, Pump outfall Management (North of Lake Lery).

PBS-11 CAERNARVON DIVERSION OPERATION MODIFICATION

This project would require an amendment to the authorization for the freshwater diversion and was determined to be beyond the scope of PL101-646. However, the Caernarvon Interagency Group (CIAG) recently modified the operational scheme. The minimum discharge has been changed from 500 cfs to 700 cfs. In December '93, January '94, and February '94 the structure will be opened to its design capacity of 8000 cfs until 5 ppt is reached at the target stations. The discharge will then be cut back until 3 ppt is reached in Bay Gardene.

PBS-12 DIVERT CAERNARVON OUTFALL INTO MARSHES NORTH OF LAKE LERY -

A feasibility study conducted by the Louisiana Department of Natural Resources did not recommended construction and therefore this project will not be a component of the Comprehensive restoration plan for the Breton Sound Basin.

PBS-10 CAERNARVON SEDIMENT DIVERSION

Location.

The proposed project would be located on the left descending bank of the Mississippi River downstream adjacent to the Caernarvon Freshwater Diversion Structure.

Problems and Opportunities.

This project is a concept. Marsh loss occurred in this area, Caernarvon Subbasin, at a rate of 335 acres per year due to subsidence, saltwater intrusion, and sediment deprivation.

Physical characteristics.

As it is currently proposed, this project would consist of four deep siphons to be constructed adjacent to the Caernarvon Freshwater Diversion Structure.

Benefits and Costs.

The project cost is estimated to be \$12,500,000. Further investigation as to the potential acreage and habitat benefits are required.

Effects and Issues.

Estuarine fisheries would be displaced farther gulfward in the basin. Siltation of oil and gas access canals could occur.

Impacts to the main river channel such as induced maintenance dredging, and the relocation of a two lane highway and railroad tracks and existing activities such as oil and gas pipelines, and oil and gas access canals would occur. Estuarine fisheries would be displaced farther gulfward in the basin. Real estate acquisition problems would likely be incurred. would be a structural modification of the existing Caernarvon Freshwater Structure which was constructed at a location along the Mississippi River which would supply a majority of freshwater and minimal sediments to benefit oyster fisheries. Therefore, this site is not rich in sediment and deep siphons were determined to be engineeringly infeasible. In addition, it is not efficient to put sediment into the fairly healthy marsh in the upper basin of Breton Sound. Furthermore, in dry years, the outfall channel for sediment would become a channel for saltwater intrusion.

PBS-15 SCARSDALE SPILLWAY

Location.

The project would be located between Scarsdale, Louisiana and Stella, Louisiana adjacent to the left descending bank of the Mississippi River.

Problems and Opportunities.

Marsh loss occurred in this area, River aux Chenes Subbasin, at a rate of 195 acres per year from 1974-1990 due to subsidence, saltwater intrusion and sediment deprivation.

Description of Features.

It was assumed to be comparable to the Bonnet Carre Spillway project. The Bonnet Carre project consists of a 6-18'x18' multi-cell box culvert with corresponding inflow and outflow channels designed to divert freshwater from the Mississippi River into the Lake Pontchartrain. The proposed Scarsdale Spillway project inflow and outflow channels would be designed to divert freshwater and sediments from the Mississippi River into Breton Sound basin. The box culverts used in the Bonnet Carre Freshwater Diversion are 265 feet in length with inflow and outflow u-frame culverts of 120 feet and 105 feet respectively. These features are assumed to be comparable in the proposed Scarsdale Spillway project.

The mainline Mississippi River levee was set back over the new structure. A portion of the existing Bonnet Carre upper guide levee was also relocated. The Scarsdale Spillway project would require removal of the front protection and back levees and the raising of the lateral levees.

The inflow channel of the Bonnet Carre Freshwater Diversion is 1,180 feet in length with a 200 foot bottom width. The outflow channel is 31,360 feet in length with a bottom width of 195 feet and a water depth of 30 feet. A sediment trap with a capacity of 665,000 cubic yards is located 3,500 feet downstream of the structure. The sediment trap has a 780 foot bottom width at elevation at -36.0 National Geodetic Vertical Datum (N.G.V.D.) and a length of 1,450 feet. At the end of the outflow channel there is a 2,400 foot overflow weir running parallel to the railroad tracks at the lakefront. The weir transitions from 195 foot bottom width at elevation -28.4 NGVD. to a bottom width of 400 feet at elevation -2.4 N.G.V.D. These features are assumed to be comparable in the proposed Scarsdale Spillway project.

Benefits and Costs.

The project is estimated to cost \$24,300,000. A major study effect would be required to determine the benefits of the proposed project. (50 year project life)

Effects and Issues.

This type of structure would cause significant changes within the entire Breton Sound basin. Estuarine fisheries would be displaced farther gulfward. There would be enormous amount of siltation in oil and gas access canals, etc. Depending on the size of the spillway, navigation in the river could be affected; drinking water supplies could be threatened more often by saltwater intrusion; wetlands in the

PROJECTS CONSIDERED BUT NOT IN THE RESTORATION PLAN

active delta may deteriorate faster; and a major shift in estuarine fisheries species could occur.

The engineering and design of a major sediment diversion structure through a mainline Mississippi River levee is untested, except for the structure at the Old River complex. In addition, this project would have enormous impacts on the primary purpose of the Caernarvon Freshwater Diversion Structure possibly rendering it obsolete, this project will not be a component of the Comprehensive restoration plan for the Breton Sound Basin.

Status.

The project was not selected for inclusion in the comprehensive restoration plan for the Breton Sound Basin.



Legend

- 1 AB Floating
- 2 AB Submerged
- 3 Fresh Water
- 4 Estuarine Water
- 5 Fresh Marsh
- 6 Intermediate Marsh
- 7 Brackish Marsh
- 8 Saline Marsh
- 9 Estuarine Marsh
- 10 Cypress Forest
- 11 Bottomland Forest
- 12 Dead Forest
- 13 Bottomland SS
- 14 Shore/Flat
- 15 Ag/Pasture
- 16 Upland Barren
- 17 Upland Forest
- 18 Developed
- 19 Upland SS

Louisiana Coastal Wetlands
Restoration Plan
Breton Sound Basin
1988 HABITAT DATA

date: April 1993

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